Solve Proportional Relationships

Lesson 3

Objective

Students will be able to recognize and represent proportional relationships between quantities.

Write and Solve Proportions

A **proportion** is an equation stating that two ratios or rates are equivalent.

ex. Numbers

$$\frac{6}{8} = \frac{3}{4}$$

Algebra

$$\frac{a}{b} = \frac{c}{d} \qquad b \neq 0,\ d \neq 0$$

Consider the following proportion.

$$\frac{a}{b} = \frac{c}{d}$$

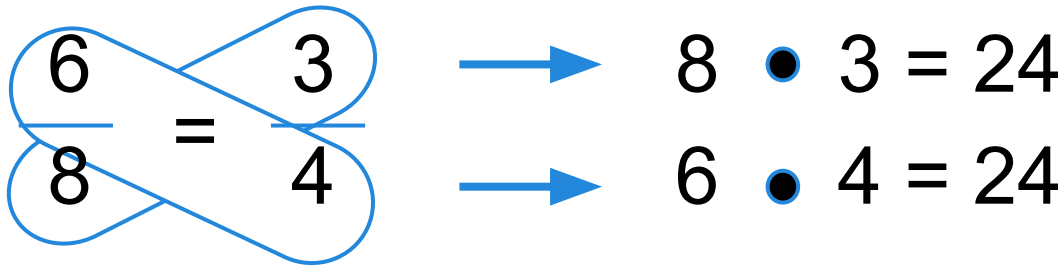
Multiply each side by **bd** and **divide** out the common factors.

$$\frac{a}{b} \cdot bd = \frac{c}{d} \cdot bd$$

$$ad = bc$$

Simplify.

The product ad and bc are called **the cross products of a proportion**. The cross products of any proportion are equal.

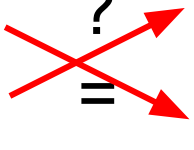


- bc are the means of the ratio.
- ad are the extremes of the ratio.
- product of the means = product of the extremes

Cross Product Rule

- Write the information as a proportion.
- Cross multiply to see if they are equal.

ex. $\frac{225}{9} \overset{?}{=} \frac{175}{7}$



$225 \times 7 = 175 \times 9$

$1575 = 1575$

ex. $\frac{14}{28} \overset{?}{=} \frac{12}{36}$

$14(36) = 28(12)$

$504 \neq 336$

You try! Are they equal?

a. $\frac{6}{12} = \frac{10}{18}$ No

b. $\frac{6}{36} = \frac{6}{1}$ No

c. $\frac{1.2}{1.8} = \frac{2.4}{3.6}$ Yes

d. $\frac{3.6}{4.2} = \frac{4.5}{5.6}$ No

Compare Simplified Ratios

$$\frac{14}{28} \stackrel{?}{=} \frac{12}{36}$$

You can simplify each fraction - if they are equal then the two ratios are equivalent - if they are not equal then the two ratios are not proportional.

$$\frac{14}{28} = \frac{1}{2}$$

$$\frac{12}{36} = \frac{1}{3}$$

$$\frac{1}{2} \neq \frac{1}{3}$$

not proportional

Finding the missing term

The missing term in a proportion can be located in any of the four position. Use the Cross Product rule or Proportional Reasoning to help solve.

Cross Product Rule

Solve: $\frac{n}{16} = \frac{18}{32}$

$\frac{n}{16} = \frac{18}{32}$ Cross multiply.

$32n = 16 \cdot 18$

$\frac{32n}{32} = \frac{288}{32}$

$n = 9$

Proportional Reasoning

Solve: $\frac{n}{16} = \frac{18}{32}$

Think:
16 x 2 = 32, so what number times 2 equals 18?

Check your work to justify your answer.

You Try! Find the missing term.

e $\frac{5}{6} = \frac{n}{48}$

f. $\frac{9}{t} = \frac{36}{8}$

g. $\frac{0.9}{3.6} = \frac{1.2}{y}$